

**Goals:**

- I can simplify radical expressions.
- I can add, subtract, multiply, and divide radical expressions.

Name: \_\_\_\_\_

Algebra II  
Ops w/ Radical Expressions**KeyConcept Product Property of Radicals**

**Words** For any real numbers  $a$  and  $b$  and any integer  $n > 1$ ,  $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$ , if  $n$  is even and  $a$  and  $b$  are both nonnegative or if  $n$  is odd.

**Examples**  $\sqrt{2} \cdot \sqrt{8} = \sqrt{16}$  or 4 and  $\sqrt[3]{3} \cdot \sqrt[3]{9} = \sqrt[3]{27}$  or 3

**Example 1: Simplify Expressions with the Product Property****Simplify.**

a.  $\sqrt{32x^8}$

b.  $\sqrt[4]{16a^{24}b^{13}}$

c.  $\sqrt[3]{x^7y^9}$

**KeyConcept Quotient Property of Radicals**

**Words** For any real numbers  $a$  and  $b \neq 0$  and any integer  $n > 1$ ,  
 $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$ , if all roots are defined.

**Examples**  $\frac{\sqrt{27}}{\sqrt{3}} = \sqrt{9}$  or 3       $\sqrt[3]{\frac{x^6}{8}} = \frac{\sqrt[3]{x^6}}{\sqrt[3]{8}} = \frac{x^2}{2}$  or  $\frac{1}{2}x^2$

**Example 2: Simplifying Denominators**

a.  $\frac{3}{\sqrt{2x}}$

b.  $\frac{x}{\sqrt[3]{y}}$

If the denominator is:	Multiply the numerator and denominator by:	Examples
$\sqrt{b}$	$\sqrt{b}$	$\frac{2}{\sqrt{3}} = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$ or $\frac{2\sqrt{3}}{3}$
$\sqrt[n]{b^x}$	$\sqrt[n]{b^{n-x}}$	$\frac{5}{\sqrt[3]{2}} = \frac{5}{\sqrt[3]{2}} \cdot \frac{\sqrt[3]{2^2}}{\sqrt[3]{2^2}}$ or $\frac{5\sqrt[3]{4}}{2}$

Example 3: **Simplifying Expressions with Quotient Property**

**Simplify.**

a.  $\frac{x^3}{\sqrt{y^7}}$

b.  $\sqrt{\frac{6}{5x}}$

**Concept Summary** Simplifying Radical Expressions

A radical expression is in simplified form when the following conditions are met.

- The index  $n$  is as small as possible.
- The radicand contains no factors (other than 1) that are  $n$ th powers of an integer or polynomial.
- The radicand contains no fractions.
- No radicals appear in a denominator.

Example 4: **Multiplying Radicals**

**Simplify.**

a.  $5\sqrt[3]{-12ab^4} \cdot 3\sqrt[3]{18a^2b^2}$

b.  $2\sqrt{8x^3y^2} \cdot 3\sqrt{2x^5y^2}$

## Homework

Name: \_\_\_\_\_

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**Simplify.**

1)  $\sqrt{36ab^4c^5}$

7)  $\frac{\sqrt{2x}}{\sqrt{3x^3}}$

2)  $\sqrt{144x^7y^5}$

8)  $\frac{2x}{\sqrt[3]{3y}}$

3)  $\sqrt{81x^9y^4z^2}$

9)  $5\sqrt{2x} \cdot 3\sqrt{8x}$

4)  $\sqrt[3]{27x^{10}y^{12}}$

10)  $6\sqrt[3]{3x} \cdot 2\sqrt[3]{2x^2}$

5)  $\frac{\sqrt{c^5}}{\sqrt{a^9}}$

11)  $4\sqrt{5a^5} \cdot \sqrt{125a^3}$

6)  $\sqrt{\frac{5x}{2y}}$

12)  $4x\sqrt{3} \cdot 3y\sqrt{3}$